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ABSTRACT

A series of analytical studies on learning, cost, and field projects, conducted by Wilbur Schramm and his associates at the Institute for Communication Research at Stanford University, are reviewed in this issue. The researchers analyzed the potential of instructional technologies in developing countries with particular reference to: (1) intermediate technologies such as radio, audio cassettes, and print; (2) use of media for out of school populations; and (3) ways in which media may be combined to complement and reinforce each other. They concluded that the uses of relatively inexpensive media such as radio have not been adequately explored, and that variation in learning is more dependent on how a medium is used than on which medium is used. Two studies are discussed in depth: instructional television in American Samoa, and Mexican Telesecundaria. (Author/STS)

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LEARNING DEPENDS MORE ON HOW A MEDIUM IS USED THAN ON WHICH MEDIUM IS USED

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INSTRUCTIONAL TECHNOLOGY REPORT

Stanford research on television and its lower cost alternatives shows that

LEARNING DEPENDS MORE ON HOW A MEDIUM IS USED THAN ON WHICH MEDIUM IS USED

"The most important need for developing countries is to conceptualize their educational problems and then to choose the most cost-effective system — which may include various media — to solve those problems. No single medium can solve all problems, and variation in learning is more dependent on how a medium is used rather than which one is used."

and, "While a number of developing countries have recently invested heavily in a 'big' medium — television — there is evidence to suggest that use of the 'little' media, especially radio, has not been adequately explored."

According to a review report prepared for the Bureau for Technical Assistance, U.S. Agency for International Development by Laurence Wolff, the above may be considered the major policy conclusions of Wilbur Schramm and his associates at the Institute for Communication Research, Stanford University, as the result of a series of studies they did in 1971-73 for A.I.D.

The researchers, under their contract with the Bureau for Technical Assistance, studied and analyzed the potential of instructional technologies in developing countries, with particular reference to:

- intermediate technologies such as radio, audio-cassettes, and printed materials
- use of the media as a basis for extending educational opportunities to out-of-school populations, and
- ways in which the media may be combined to complement and reinforce each other.

The overview of the research summarizing the available information about the use of media in education is presented in the book-length report Big Media, Little Media by Wilbur Schramm. According to Schramm, the media may be divided roughly into two types, those which are 'big' in cost and complexity as *television, computer-assisted instruction, films* and *video tape*, and those which are 'little' as *radio, programmed instruction, filmstrips, slides, transparencies and other visuals*, and *audiotape*.

This issue of Instructional Technology Report is devoted to reviewing a series of analytical studies on learning, cost and field projects — the sources of the conclusions cited above. A complete bibliographical listing can be found on page three in the column "Across the Director's Desk."

STANFORD REPORTS EXAMINE FIELD PROJECTS UTILIZING INSTRUCTIONAL TECHNOLOGY

In Big Media, Little Media, Wilbur Schramm classifies field projects utilizing instructional technology under four major categories based on their purpose. These categories are:

- reform of the national education system
- extension of formal schooling to previously unreached populations
- enrichment of regular school programs
- extension of programs outside the formal educational system, usually to adults.

Media for National Educational Reform

Up to now only four countries have used instructional media to reform the national educational system; they may be summarized as follows:

Place	Starting Date	Levels Served	Medium Used	Number of Students
Niger	1964	First five grades	ITV	800 (1973)
American Samoa	1964	All primary and secondary grades, plus preschool and adult services	ITV	8,100 (1972)
El Salvador	1969	7th, 8th, 9th grades, now expanding to primary school, teacher training and out-of-school education	ITV	62,000 (1973)
Ivory Coast	1971	First two grades; expanding a grade at a time to cover all six primary grades; also in-service teacher training	ITV	60,000 (1972)

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RESEARCH PROBLEMS AND STRATEGIES FOR DEVELOPING FIELD EXPERIMENTS

One major problem in media research is that the researcher compares systems of instruction with different elements, rather than the media themselves. A second problem is that the researcher must make a compromise between "realism" and experimental control. If he emphasizes scientific reproducibility, he may describe a situation that never occurs. If he tries to answer questions of practical policy, he may not be able to generalize his results.

These problems are detailed by two Stanford reports: Notes on Instructional Cross-Media Comparisons by Wilbur Schramm with John Mayo, and Notes on Case Studies of Instructional Media Projects by Schramm. Some other problems of field studies may include the following:

- The administrator of a project may be so committed to a project that he may not be likely to consider alternatives.
- There may be both moral and political pressure to extend a reform to all groups rather than to retain some "controls."
- The cost of providing comparative treatments may be too great.
- Random assignment and control may be difficult.

Some strategies which the field researcher should attempt include:

- Defining the trade-off between "realism" and scientific experimentation.
- Providing rapid feedback to improve the new system as it develops.
- Developing criteria other than simply achievement tests and attitude scales.
- Studying cost more completely.
- Evaluating components of the system to get the most efficient combination of resources.
- Considering non-quantitative results, especially through case studies.
- Trying to incorporate replications of other field studies in his study.
- Using "quasi-experimental designs," in which non-equivalent control groups are equated by statistical treatments.

The Case Study Method

The case study method is another valuable and often overlooked strategy in media research. The purpose of a case study is to illuminate a decision or a set of decisions in order to suggest hypotheses for further testing or to help guide further decision making. Its sophistication varies with the time and resources put into it. It may be a swift and short journalistic account or it may be a thoughtful overview and interpretation of what was done and what was learned.

A case study has certain advantages: it can be done after the fact, and it can cover a sweep of time and space. But it cannot provide assurance that its conclusions are reproducible in other situations. In addition, it places a great responsibility on the researcher.

Instructional Technology Report, published bimonthly, is the official newsletter of the Information Center on Instructional Technology. The Center serves as an international clearinghouse for materials and information on important developments in the use of technology for improving education around the world. The Center is operated by the Academy for Educational Development, a private non-profit organization, and is supported by the Bureau for Technical Assistance of the U.S. Agency for International Development.

The sources of data for a case study come from interviews, observation, documents, and secondary analysis. Documents are particularly important and often overlooked when one is doing a case study over a short period of time.

INSTRUCTIONAL TELEVISION IN AMERICAN SAMOA

ITV in American Samoa was designed to help that territory leap from the era of the one room schoolhouse, rote learning, and untrained teachers to a modern educational system similar to that of the United States. The program began massively in 1964 with broadcasts to all eight primary grades, and expanded to cover the complete high school in 1965. The television studio built in 1964 was more elaborate than any other educational facility in the world. It included six open circuit VHF channels and four studios which broadcast about 6,000 new programs a year.

All the costs were borne by the United States government, which administered American Samoa as a trust territory, and in 1964 all the educational leaders and ITV administrators were mainland Americans. Until recently very little analysis or evaluation of the project had been done.

The results of the analysis in the report ITV in American Samoa — After Nine Years by Wilbur Schramm show the following:

Costs — The cost of ITV is estimated at $157 per student per year. This figure is high because only 8,100 students, the number of students in the public system, are served by the system.

Academic Achievement — There is evidence that Samoan high school graduates who go to the University of Hawaii do better the longer they have been in the television system. In addition, English tests given to children on Swain's Island, 100 miles away from the main islands of American Samoa and lacking any ITV, showed that their English was very poor compared to students receiving ITV.

In general, the present academic achievement of Samoans is similar to that of underprivileged blacks and Spanish speakers on the American mainland. This may be the result of culture-biased tests as well as of their having to learn a second language in school.

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ACROSS THE DIRECTOR'S DESK. . .

The Information Center, in circulating this overview report, seeks to bring to your attention some significant findings on television and its lower cost alternatives. In this newsletter we are able to present only highlights of the research. The full reports cited below are available from the Center to developing country educators, planners and researchers for as long as our present printing lasts. For United States researchers who have access to the Education Resources Information Center (ERIC) materials we have included the order numbers and price of microfiche and hardcover reproduction of any of the documents which are in the ERIC system. Orders may be placed through ERIC Document Reproduction Service, P.O. Box 0, Bethesda, Maryland 20014.

1. Notes on Instructional Cross Media Comparisons by Wilbur Schramm, December 1971, 51 pages. A discussion of problems and strategies in comparative research of instructional technology projects.

2. Notes on Case Studies of Instructional Media Projects by Wilbur Schramm, with John Mayo, December 1971, 41 pages. A discussion of the uses and procedures of the case study method in media research.

3. Big Media, Little Media by Wilbur Schramm, March 1973, 333 pages. An overview of evidence concerning the use of media for educational purposes. ERIC document number ED 077 186, 65c microfiche, $13.16 hardcover.

4. ITV in American Samoa — After Nine Years by Wilbur Schramm, March 1973, 55 pages. An evaluation of the instructional television project in American Samoa. ERIC document number ED 077 189, 65c microfiche, $3.29 hardcover.

5. The Mexican Telesecundaria: A Cost Effectiveness Analysis by John K. Mayo, Emile G. McAnany and Steven Klees, March 1973, 152 pages. An evaluation of the instructional television project for extending secondary education in Mexico. ERIC document number ED 076 059, 65c microfiche, $6.58 hardcover.

6. A Report on the System of Radio-primaria in the State of San Luis Potosi, Mexico by Peter L. Spain, March 1973, 127 pages. An evaluation of the instructional radio project for primary schools in San Luis Potosi, Mexico. ERIC document number ED 077 187, 65c microfiche, $6.58 hardcover.

7. The Radio Schools of the Tarahumara, Mexico: An Evaluation by Sylvia Schmelkes de Sotelo, March 1973, 66 pages. An evaluation of the instructional radio project for rural primary schools in Tarahumara, Mexico. ERIC document number ED 077 188, 65c microfiche, $3.29 hardcover.

8. The Effectiveness of Alternative Instructional Media: A Survey by Dean Jamison, Patrick Suppes and Stuart Wells, February 1973, 72 pages. An overview of research on the effectiveness of traditional classroom instruction, instructional radio, instructional television, programmed instruction, and computer-assisted instruction. Also published in the Review of Educational Research, Vol. 44, 1974, pp. 1-67. ERIC document number ED 076 058, 65c microfiche, $3.29 hardcover.

9. The Cost of Instructional Radio and Television for Developing Countries by Dean Jamison with Steven Klees, March 1973, 57 pages. A description of a method to evaluate per student costs of instructional radio and television and the application of that method to television projects in Colombia, American Samoa, El Salvador, Mexico, and Ivory Coast and radio projects in Thailand, Mexico, and Indonesia. ERIC document number ED 077 213, 65c microfiche, $6.58 hardcover.

10. Teacher Observation in Mexico by Judith A. Mayo, May 1973, 38 pages. An evaluation of teaching methodology in a television project for secondary schools and in regular secondary schools in Mexico. ERIC document number ED 077 220, 65c microfiche, $3.29 hardcover.

11. Radio's Role in Development: Five Strategies of Use by Emile G. McAnany, September 1973, 28 pages. A summary of the uses, problems, and potential of radio in aiding rural development. Published as a Bulletin of the Information Center on Instructional Technology, Academy for Educational Development, 1424 16th Street, N.W., Washington, D.C. 20036.

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Anyone having new materials to contribute on "Videotaping: A Medium for Social Change," the subject of our last Instructional Technology Report, please send them along to the Center, ATTENTION: Randall H. Casey who developed the subject for us.

ITV IN AMERICAN SAMOA

(Continued from page two)

Attitudes — Both students and teachers become progressively less enthusiastic about ITV as they go from the lower grades to high school. This change may be a result of the greater competence of secondary school teachers and of the need for greater classroom decision making and student participation at the secondary level.

Conclusions — It may be necessary to reconsider the kinds of skills the children are being taught. The standardized tests used in Samoa measure academic skills, but very few Samoans will go to college. A more relevant curriculum might provide practical and specifically employable skills.

Specific media do have particular strengths. Now may be the time to cut back on the use of ITV and integrate it with other media and regular classroom teaching to produce the most effective instructional system.

Applications to Other Projects — Some general applications of the Samoan experience to other technology projects are:

- ITV should be introduced gradually grade by grade rather than immediately and massively.
- Strong leadership is needed at the top. In this case it was provided by Governor H. Rex Lee.
- A system essentially imposed from the outside may over a period of time become integrated into the local educational scene. In this case, by 1973 outsiders held only a few technical jobs and Samoans were running their educational system.

FIELD PROJECTS UTILIZING INSTRUCTIONAL TECHNOLOGY

(Continued from page one)

These four projects are similar in many ways:

- Their purpose is to "modernize" the content and method of public education and to expand enrollment.
- They have substantial outside support from national and international lending and technical assistance agencies.
- They rely upon television for core teaching.
- They support the classroom teacher through provision of classroom materials, feedback from classroom to ITV, in-service training, and curriculum revision.
- They took at least three to four years from inception to actual broadcasting.

The projects are different in the following ways:

- American Samoa introduced ITV in one year to nine grades, while the other projects expanded slowly over a period of years.
- Niger uses untrained monitors rather than regular teachers in the classrooms.
- El Salvador provides long-term (nine months) retraining to all regular teachers, while the other countries have only short term training.
- The Niger program is small and independent of the Ministry of Education, while the others are integrated into the Ministry.

The per student costs of the programs vary greatly, depending on the number of viewers. In Niger, where there were only 800 viewers in 1969, the cost was about $1,200 to $1,300 per student per year. According to the cost study of Jamison and Klees, in El Salvador, with 48,000 viewers in 1972, it was $24.35 per student.

The results of the programs also vary greatly. In Niger the program still served only 800 primary school students in 1973. But the quality of the programs for these students was high and there was almost no dropout in the ITV classrooms. In American Samoa the spoken English of students improved considerably. In El Salvador enrollment in junior high school increased greatly, teaching methodology became more "modern," and students' scores on general learning and achievement tests increased significantly. In Ivory Coast data are not yet available on the results of the project.

While there is no direct evidence that a medium other than ITV could not be used for national educational reform, it appears that the high visibility and complexity of television make it a strong catalyst for institutional change.

Other major conclusions for the future based on these four projects include:

- The need for heavy outside assistance at the beginning of the project.
- The need for strong support from top government officials.
- The possibility of significant resistance from the educational establishment or from teachers.
- The need to proceed toward more focussed use of the chosen medium rather than blanket use.
- The need to integrate the medium fully into the system of instruction.
- The need to phase the introduction of the medium year by year rather than introduce it to all grades simultaneously.

Media for Extending the School

At least 30 countries have used the media to extend the school through correspondence; radio; television; and mixed media at all educational levels and in both industrial and developing countries. Some examples include the "Open University" of Great Britain, the "NHK Gakuen" of Japan (a radio-television correspondence high school), the radio correspondence schools of Australia, the "telesecundaria" of Mexico, and the Kenya radio correspondence in-service course for teachers.

The number of students in these programs range from a few thousand to over one million in non-credit courses in France, Netherlands, and Sweden. The majority of the students are young adults. Some of the more common aspects of these programs include:

- attempts to get the student more actively involved in learning by providing him with self-help materials,
- flexible entrance standards,
- a trend toward multi-media use, especially radio or television with correspondence.

There is significant dropout of students in such systems, often as much as 70%, from the beginning of the course to the end. But those who do finish usually do as well in regular school courses as those who studied in the regular classroom.

In most cases the cost per student of the media programs is lower than that of comparable formal classroom teaching:

Estimated Costs for Projects Utilizing Media Compared with Conventional Classroom Instruction

	Media Cost Per Student Year	Conventional Cost Per Student Year
Mexico Telesecundaria	$ 151	$ 200
British Open University	1,200	2,000-2,400
Australian Radio Correspondence School	310	600-1,200 (boarding school)
German Telekellog	143	400-500
Japan NHK Gakuen	308	540
Kenya Teachers Program	100	200-400 (boarding school)

The principal conclusions from study of these projects are:

- They usually cost less than conventional classroom instruction.
- Students usually learn as much from them as from conventional classroom instruction.
- They offer opportunities to students which would ordinarily not be available because of cost, logistics, or staffing problems.

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- They work in both industrialized and developing countries.
- Both radio and television are effective, but radio usually costs about 1/5 as much as television.
- They require good study materials and a system of feedback from the field to the broadcast station.

Media for Enrichment of Formal School Programs

The objective of projects of this sort is to improve instruction of individual subjects rather than to provide systemwide quality improvement or expansion. Some examples include weekly ITV programs for six subjects in Zambia, ITV in science and social studies in isolated school villages in Japan, ITV for science instruction in India, ITV in primary schools in Colombia, radio programs in social studies, English, and music in Thailand, and programmed instruction in Rhodesia.

There has been little research of these projects, especially in low-cost media such as filmstrips or cassette tape recorders, but by and large they do seem to help improve student learning. One multimedia use, that of filmstrips plus radio or tape cassettes, has not yet been significantly tested in developing countries.

Media for Non-Formal Education

Media projects in non-formal education attempt to provide learning opportunities in subjects such as literacy, health, agriculture, and community self-help which have not been obtained in formal schooling. The audience is usually adults, who may listen or watch individually or in groups. The setting is often rural. Radio is the medium most often used.

In his report Radio's Role in Development: Five Strategies of Use, Emile G. McAnany describes three types of organized listening groups in non-formal education:

The Deciding Group. In this case a group of adults listens to a program, often in agriculture, health, or home care, discusses the concepts presented under the guidance of a group leader, and then takes individual or collective action. Examples include those of India and Ghana. The small amount of research on these groups suggests that group members are influenced to change their behavior. But many of these programs suffer from a lack of field support and feedback which limits their effectiveness.

The Study Group. In this case a group of adults, usually illiterate, joins in classes which are led by a volunteer "monitor" and which provide literacy and "basic" education. Radio Sutatenza in Colombia, which began 25 years ago, is the most successful example of this type of program. Currently it serves 20,000 radio forums. It also has an extensive publishing program to supplement the forum activities.

The Discussing Group. In this case a group participates in defining its own problems to get a sense of its power to mobilize for change. The approach is non-directive and the goal is community organization. Examples of these programs can be found in Niger, Togo, and Senegal. These programs seem to work best when there is significant social ferment and desire for change in the rural areas.

In addition to broadcasting to an organized listening group, the media may be used to provide development messages to the general populace which may include information on vaccination campaigns, on nutritious foods (such as INCAPARINA in Central America), or on available agriculture and health services. The mass media appear capable of providing information, influencing audience knowledge and attitudes, and getting them to change some instances of behavior, as when the rural population accepts a large scale vaccination campaign.

The potential advantages of radio for all these tasks are:

- Cost: the costs of radio are usually about 1/5 those of television, and radio production does not require high levels of technical training.
- Coverage: radio already reaches much of the rural population.
- Effectiveness: research up to now suggests that radio is as effective as television and traditional classroom instruction.
- Localness: the lower expense of radio allows for the creation of local stations closer to the needs of the population and providing a greater opportunity for flow of information from the field to the station.

Some of the problems in the use of radio include the facts that:

- Efforts to use radio for rural development have been fragmented and incomplete.
- Most radio projects are poorly planned and administered.
- Radio is reaching only a minute fraction of its potential audience.
- There is little evidence concerning the cost-effectiveness of these projects.

The main conclusions about the role of the media in non-formal education are:

- Rural forums and discussion groups can effectively use the mass media, especially radio, to provide an impetus for change.
- For maximum effect, non-formal education needs multi-media combinations, including print materials and interpersonal contact.
- For maximum effect, non-formal education needs to be linked with sufficient available services in the subject area of broadcasts.

As of June 15, 1974 the Information Center on Instructional Technology, Academy for Educational Development, will be located at

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THREE MEDIA PROJECTS TO EXTEND EDUCATIONAL OPPORTUNITY IN MEXICO DETAILED

The Stanford team evaluated three technology projects which were designed to expand formal education to the rural areas of Mexico. These are described in detail in four reports, and are summarized in the following table:

	PROJECT		
	Telesecundaria	**Radioprimaria**	**Radio Schools of Tarahumara**
Medium	television	radio	radio
Location	Federal district and 7 neighboring states	State of San Luis Potosi	Tarahumara mountains in the State of Chihuahua
Educational Level	secondary	primary	primary
Estimated Audience	28,976 students (1972)	44 schools (1972)	1,081 students (1971)
Controlling Authority	Federal Secretariat of Education	Federal Secretariat of Education and Department of Education of San Luis Potosi	Jesuit missionaries

Due to limitations of space in this newsletter only the Telesecundaria Project will be reviewed here; the Radioprimaria Project and the Radio Schools of Tarahumara will be summarized in our next issue of Instructional Technology Report.

Telesecundaria

According to The Mexican Telesecundaria: A Cost Effectiveness Analysis, by John K. Mayo, Emile G. McAnany, and Steven Klees, *Telesecundaria* began experimentally in 1966 under the Federal Secretariat of Education and in 1972 served 28,976 students in the Federal District and in seven neighboring states. Its purpose is to provide secondary education (grades 7 to 9) to students who are too distant from regular formal secondary schools.

Telesecundaria classes usually meet in space provided by local communities, rather than in formal, large scale buildings. The classroom coordinators are drawn from the ranks of 5th and 6th grade primary school teachers rather than regular certified secondary teachers. Guidebooks are provided to the coordinators and inexpensive workbooks are sold at low cost to the students.

Programs from Mexico City are broadcast over time donated on commercial television between 7:45 a.m. and 2:00 p.m. Monday through Friday and Saturday morning programs are provided to the coordinators. Teleclasses average 20 minutes in length, with the remaining 40 minutes of each class divided between preparation and follow-up activities supervised by the classroom coordinators.

The Stanford researchers utilized a number of techniques to evaluate television instruction, and to compare it to conventional classroom instruction. Their findings are described below:

Input characteristics. *Telesecundaria* schools tend to be small and flexible institutions rarely serving more than 75 students, while conventional schools are large formal institutions customarily serving more than 500 pupils. *Telesecundaria* schools do not possess as many facilities or learning aids as conventional schools. *Telesecundaria* students are generally older and of lower socio-economic status and *Telesecundaria* teachers generally have less training than teachers in conventional schools.

The cost per student in conventional schools in 1972 was $200 compared to $151 for *Telesecundaria*. If the conventional system were extended to the rural areas where most *Telesecundaria* classes are located, then its costs would be from $240 to $431 per student, because in the rural areas there would normally not be a large number of students per school to provide economies of scale.

Output characteristics. *Telesecundaria* students did about as well as students in conventional classrooms in mathematics, Spanish, and chemistry achievement tests. Students in the urban states of the Distrito Federal and Mexico gained more than those in the rural states of Hidalgo and Morelos. In general ability examinations, *Telesecundaria* students scored lower than students in conventional schools. Parents' socio-economic background did not affect achievement of *Telesecundaria* students, while it did affect achievement of students in conventional schools.

Both types of students wanted more schooling and better jobs, although students in conventional schools were more likely to seek university training and professional careers.

In general *Telesecundaria* students liked their program, although fully 19% said they could not see the television clearly. Although some observers outside the *Telesecundaria* system consider it "second class," the students themselves defend the quality of their instruction and do not often transfer to the regular schools.

A follow-up study showed that *Telesecundaria* graduates who did not further their education were holding menial jobs not commensurate with their aspirations.

Teacher observation. According to Teacher Observation in Mexico, by Judith A. Mayo, one of the most interesting methods of evaluation used was that of teacher observation. The researchers observed 97 ninth grade teachers selected from a random sample of *Telesecundaria* and regular classroom teachers in four Mexican states.

SIZE OF AUDIENCE AFFECTS PER STUDENT COST OF RADIO AND TELEVISION

Overall, it appears that the 'smaller' media are low in cost with a small receiving population, instructional television may be reasonable in cost with a sufficiently large population, and radio is probably usable with both small and large populations. While computer assisted instruction is still expensive, there is evidence that its costs are rapidly decreasing as the technology improves.

This was the conclusion of Dean Jamison and Steven Klees in their report The Cost of Instructional Radio and Television for Developing Countries, and corroborated by Schramm in Big Media, Little Media.

In cost analysis researchers compare the costs of the different media. The results of these studies are often heavily dependent on assumptions built into them about the size of the audience and the expected length of the project as well as the statistical treatment of the cost of capital investment. Studies have been done of radio and television, computer-assisted instruction, programmed instruction, filmstrips, etc.

Jamison and Klees, studying the costs of eight radio and television projects, found that the size of the audience greatly affects per student costs of radio and television. For instance, among the television projects analyzed, American Samoa has by far the highest student hour costs. Since the project is already reaching nearly all students in grades 1 to 9, it has limited opportunities for cost-cutting. The Mexican radio project, which also has relatively high costs compared to Thailand and Indonesia, could achieve significant economies if it expanded. These cost figures depend upon local salary scales, of course, so cannot be strictly compared.

The major conclusions about costs of radio and television are:

- The costs of instructional television can be expected to range from 1.5¢ to 15¢ per student per hour, depending on the number of students being served. The lower limit of 1.5¢ can be reached only if almost a million students located in a relatively small region use the system.
- The costs of instructional radio can be expected to range from 1/3¢ (for several *hundred* thousand students) to 3 or 4¢ (for several thousand students) per student per hour. This is about one fifth of the cost of television.
- Because of heavy investment in the first years, a radio or television project must operate at least 10 to 20 years to allow unit costs to fall to reasonable levels.

Per Student Costs of Eight Radio and Television Projects

Project	Yr. of Information Source	No. of Students Using Project	Student Hour Cost*
Television			
Colombia	1965	275,000	$ .062
American Samoa	1972	8,100	1.10
Mexico	1972	29,000	.069
El Salvador (secondary school)	1972	48,000	.143
Ivory Coast	1970	745,000**	.040
Radio			
Thailand	1967	800,000	.014
Mexico	1973	2,800	.058
Indonesia***	1971	1,200,000	.0041

* Based on a 7.5% social discount rate
** Planned for 1980.
*** Based on a planning study rather than an operating project.

THE MEXICAN TELESECUNDARIA *(Continued from page six)*

The observation form for the study was originally designed and employed in El Salvador to observe the classroom behavior of teachers in that country's instructional television system. It is based on a theory proposed by C.E. Beeby that teaching methodology passes through four stages of development: (1) drill and memorization, (2) the strict sequencing of a formal curriculum, (3) greater enrichment and flexibility, and (4) the encouragement of critical thinking.

To measure teaching methodology, the observation form lists such activities as how much the teacher lectures, dictates, asks thought questions, uses learning aids, provides individualized instruction, permits students to ask thought questions or to have discussions, and encourages group work. The form divides activities by time periods and by the number of times an activity is engaged in.

The study showed that teachers in both types of schools lectured a great deal and did not permit much classroom participation. In mathematics they sent students to the blackboard often, but in Spanish they lectured even more than in mathematics and only rarely sent their students to the blackboard.

On the whole most of the teachers observed were in Beeby's second "stage," since they rarely allowed active student participation, did not use teaching aids, and did not supervise individual work or encourage group work. Those who did some of these things tended to have students with higher mathematics achievement.

Conclusion. From all this evidence, the *Telesecundaria* appears to be accomplishing its objectives and at lower costs than the conventional system. Some changes which could be made to improve the system include:

- Administrative integration with the regular secondary school department in the Federal Secretariat of Educatiбn.
- Use of video-tape (all programs are now live), to save and up-date the programs.
- Continued expansion, possibly to the nation as a whole.
- Retraining of teachers in more modern pedagogy and regular monitoring of their classroom behavior.
- Consideration of the possibility of developing public educational television rather than depending on donated time from a commercial TV channel.

RESEARCH COMPARES AMOUNT OF LEARNING OCCURING AMONG DIFFERENT MEDIA

Surveying over 500 experiments (done as of 1972) Dean Jamison, Patrick Suppes and Stuart Wells attempted to compare the amount of learning which occurs among different media. Their studies, reported in The Effectiveness of Alternative Instructional Media, A Survey, typically compare learning from media with learning from conventional teaching. The greatest number of studies deal with instructional television, and a considerable number with film and computer-assisted and programmed instruction.

The following are the major conclusions about the effectiveness of different media:

Traditional Classroom Instruction. Researchers have been unable to identify a component of traditional classroom instruction which consistently affects students' achievement. While many studies describe educational practices which appear to affect student outcomes significantly, other studies show that these same practices have little or no effect. There appear to be two exceptions; teacher verbal ability seems to affect student achievement and small classes seem to affect both learning and attitudes of young children. But this conclusion does not mean that schools make no difference, since school attendance clearly does affect student achievement.

Instructional Radio. The few good evaluations of instructional radio suggest that, supplemented with appropriate printed materials, it can teach most subjects as effectively as traditional classroom instruction or instructional television. Because of the potential role of radio in developing countries, much more survey and experimental research on it is needed.

Instructional Television. The numerous research studies of instructional television suggest that it can teach all grade levels and subject matters about as effectively as traditional classroom instruction and it may do relatively better at lower grade levels.

Experiments focusing on the medium alone and not on changes in methodology and subject matter almost always show that there is no difference between ITV and traditional instruction.

Programmed Instruction. The numerous evaluations of programmed instruction over the past 15 years suggest that it is generally as effective as traditional classroom instruction and may result in decreasing the amount of time required for a student to achieve specific educational goals. Students may lose motivation when faced with programmed instruction alone over a long period of time.

Computer-Assisted Instruction. The research up to now suggests that computer-assisted instruction is effective as a supplement to regular instruction at the elementary level. It may help to improve achievement scores, particularly for disadvantaged students. At the secondary and college levels, CAI is at least as effective as traditional instruction and may result in savings of student time.

The major general conclusions about learning that can be drawn from The Effectiveness of Alternative Instructional Media and from Big Media, Little Media (Schramm) are:

- Students usually learn as much from an instructional medium as from classroom teaching.
- There is no general learning superiority for 'big' media over 'little' media.
- The addition of another channel of instruction, for example, ITV plus programmed instruction, usually improves learning.
- Motivated students learn from any medium if it is competently used and adapted to their needs.
- There is no clear evidence that media are more effective for some people than for others.

In short, it appears that people can learn from any medium, and variation in learning is more dependent on how a medium is used rather than which one is used.

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